Entrustable professional activities

A useful concept for neurology education

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Abstract

Medical education is currently undergoing a paradigm shift from process-based to competency-based education, focused on measuring the desired competence of a physician. In an attempt to improve the assessment framework used for medical education, the concept of entrustable professional activities (EPAs) has gained traction. EPAs are defined as professional activities that can be entrusted to an individual in a clinical context. The Association of American Medical Colleges (AAMC) defined a set of 13 such EPAs to define the core of what all students should be able to do on day 1 of residency, regardless of specialty choice. The AAMC is currently piloting these EPAs with 10 medical schools to determine if EPAs can be used as a way to observe, measure, and entrust medical students with core clinical activities by the end of the clinical immersion experiences of the third year. The specialty of pediatrics is piloting the use of specialty-specific EPAs at 5 medical schools to assess readiness for transitions from medical school into pediatric residency training and practice. To date, no neurology-specific EPAs have been published for use in neurology clerkships or neurology residencies. This article introduces the concept of EPAs in the context of competency-based medical education and describes how EPAs might be relevant and applicable in neurologic education across the continuum. The Undergraduate Education Subcommittee of the American Academy of Neurology advocates for a proactive approach to incorporating core EPAs in undergraduate medical education and to considering an EPA-based specialty-specific assessment framework for neurology.

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Glossary

AAMC = Association of American Medical Colleges; **ABMS** = American Board of Medical Specialties; **ACGME** = Accreditation Council for Graduate Medical Education; **CEPAER** = Core Entrustable Professional Activities for Entering Residency; **EPA** = entrustable professional activity; **EPAC** = Education in Pediatrics Across the Continuum Study Group; **GME** = graduate medical education; **UME** = undergraduate medical education.

The joint Accreditation Council for Graduate Medical Education (ACGME) and American Board of Medical Specialties' (ABMS) Outcome Project shifted the emphasis in medical education from structure and process to outcomes or competencies.[1–4] Every neurologist should be paying attention to this change, as it will reverberate throughout the medical community. To answer the concerns about inadequate performance of our graduates from medical school, residency, and fellowships, we need to try a new approach. This approach will require a good deal more direct observation by supervisors at every level, but should pay dividends in the more rapid development and better performance of our learners. This article provides one path towards transitioning from the time-based traditional model of education and training to the new outcomes-based model, and we hope can spur the neurology community to action as we continually try to better prepare our learners for the requisite practices of the 21st century.

A competency is defined as "a demonstrated ability of an individual health professional, integrating knowledge, skills, values, and attitudes."[5] Since competencies can be observed, they can be assessed to ensure their acquisition.[6] Competencies demonstrated in the aggregate then form the basis for the determination of competence.

Carraccio et al.[7] laid out the steps required to make the shift from the components of the structure process to a competency-based system of medical education. First, the public needs to identify the desired outcomes for a physician of the 21st century. The Outcomes Project began this effort and Englander et al.[8] built on this work by using the ACGME/ABMS competencies as a reference set to develop a robust set of competencies that synthesized more than 150 lists from across specialties, nations, the educational continuum, and health care professions. The resultant list has 58 competencies in 8 domains that apply to the training of physicians.

Second, the paradigm shift requires the delineation of performance levels for the competencies. This work has been done for the residency years and beyond in the form of the Milestones.[9] A milestone is "a defined, observable marker of an individual's ability along a developmental continuum."[10] Neurology residency milestones were implemented in 2014 and are referenced in tables e-1 and e-2 (links.lww.com/WNL/A128).[11]

Competencies and milestones are used extensively in graduate medical education (GME), but have not been implemented in undergraduate medical education (UME). Recognizing the paradigm shift at the GME level, as well as an increasing gap between medical student graduates' performance and program directors' expectations, the Association of American Medical Colleges (AAMC) sought to develop outcomes that would presage success in GME. They brought together the medical education community and the result was the publication of the Core Entrustable Professional Activities for Entering Residency (CEPAER).[2]

The third step in the paradigm shift is to develop a framework for assessment and curriculum. The development of a framework for assessment is the step that has been perhaps most difficult as it requires a significant frame shift from proxy (e.g., multiple choice questions), norm-referenced, and predominantly summative assessment to "in the trenches," direct observation that is criterion-referenced and focused on formative assessment. In addition, the desire for objective measures of competence often led educators to measure the smallest unit of competence, readily measurable in a reliable and valid fashion but often to the point of at best questionable clinical significance. Frustrated by this deconstructed model of competence (e.g., a 30-item checklist for a history and physical in which the learner may get all the boxes checked and still be incompetent to integrate the activities in the clinical setting), ten Cate[1] and ten Cate and Scheele[12] developed the concept of entrustable professional activities (EPAs).

What are EPAs and how do they relate to competencies and milestones?

An EPA is a specific task of a profession, specialty, or point in training that a learner is entrusted to perform without direct supervision (UME to GME transition) or unsupervised (GME to practice or fellowship transition). They represent in the aggregate the essential work of a professional. While milestones are used to assess an individual's progression for a given competency, EPAs allow for documentation of an individual's ability to integrate competencies in a way that allows him or her to deliver care in a clinical context. This is akin to a driving student demonstrating the individual competencies of operating the brakes, gas pedal, and steering wheel before being entrusted

to integrate those competencies and drive a car in traffic. An individual must be able to integrate the competencies necessary for a given EPA without requiring direct supervision to transition from UME to GME. Similarly, if an individual can integrate the requisite competencies to be entrusted to perform an EPA completely unsupervised, he or she is able to transition from GME to practice.

EPA assessment tools provide a formal mechanism to assess the required level of supervision for a given student based on observations and to express in narrative form the reasoning behind that decision based on the milestones observed. Table 1 further elucidates the key differences between competencies and EPAs.

Medical students on clinical clerkships are integrated in patient care teams and are assigned tasks that require various levels of supervision. This may range from only allowing a student to observe a clinical task to allowing a student to complete an appropriate task with indirect supervision and selectively double-checking and reviewing key aspects at a later time. EPAs assist in establishing assessment standards, so that the physician observer and the learner know what is expected. A list of benefits that support the utility of EPAs in undergraduate medical education is provided in table e-3 (links.lww.com/WNL/A128).

In addition to the listed benefits, EPAs may be useful when students rotate through clinics in shorter timeframes, and, at some institutions, are sent to remote clerkship sites where a given physician may work with a student for only a few days. EPAs may enable the clerkship director to share entrustment levels with clinical preceptors and allow for student participation in clinical care during short assignments in a meaningful way.

While entrustment is ultimately a binary decision between entrustable vs nonentrustable, EPAs are often used as developmental tools with elaborated and graduated descriptors. Some examples of published EPAs in GME have 5 levels of supervisory need, where level 1 indicates not allowed to perform, level 2 is allowed under direct, proactive supervision, level 3 indicates indirect, on-demand supervision, level 4 allows unsupervised practice, and level 5 indicates that a learner is able to teach and supervise others.[13,14]

Relevance of EPAs across the continuum of neurology education

The CEPAER were published in May 2014.[2] These guidelines define a core set of 13 independently executable and measurable tasks or responsibilities that medical school graduates would be expected to perform unsupervised on the first day of residency training (see table e-4, links.lww.com/WNL/A128).

In reviewing these 13 EPAs, their relevance to neurology education becomes evident. Many of the activities listed are routinely encountered in a typical neurology rotation, which provides a rich environment to assess a learner's skills. There is a dual role for neurology rotations for medical students in the EPA assessment. The core neurology clerkship for students should ensure the entrustment of the CEPAER as part of the medical school's larger assessment effort of student performance. The neurology clerkship can offer specific

Table 1 Milestones and entrustable professional activities (EPAs)

	Milestone	EPA
Definition	Observable marker of an individual's ability along a developmental continuum	A task in the clinical setting that may be entrusted to a learner by the supervisor once sufficient competence has been demonstrated
Framework	Based on abilities of the individual that are needed to accomplish a task	Based on work tasks or activities that must be accomplished in the clinical setting
	Milestones describe each competency in terms of developmental behaviors that are expected over time (learning trajectory)	EPAs integrate multiple milestones in real-world tasks
Assessment	Assessment of developmental levels (milestone achievement)	Assessment of entrustment levels (supervision determination)
	• Novice	• Not able to perform
	• Advanced beginner	• Needs active supervision
	• Competent	• Needs on-demand supervision
	• Proficient	• May do unsupervised
	• Expert/master	• May supervise others
Utility	Educators can use milestones to design/plan educational activities and teach specific, granular abilities ("zooming in")	Educators can use EPAs as overall assessment of the achievement of various integrated milestones ("zooming out")
	Facilitates individualization of learning process	Facilitates standardization of learning outcomes

contributions to those core EPAs that can be defined and standardized across institutions and should ideally be assessed in the third year of medical school. Examples of specific contributions might include (1) taking a neurologic history and performing the neurologic examination; (2) generating a differential diagnosis for common neurologic chief complaints; or (3) interpreting common neurologic diagnostic studies. EPAs are currently being considered as a framework to unify and standardize a core of medical school graduation requirements. As medical schools across the country are considering how to embrace the concept of core EPAs, the authors hope that neurology educators will now be able to consider how the neurology clerkship may integrate with this effort.[15]

Beyond readiness for residency regardless of specialty choice, advanced neurology clinical experiences that are offered in the fourth year will also allow for the creation of transition EPAs that can help assess readiness of trainees that are selecting to go into neurology residency. Beyond what EPAs traditional clerkship students are required to achieve, students who are planning to apply to neurology residency may have neurology-specific EPAs assigned to them. They may include performing a neurologic examination that is focused on the manifestations of movement disorders, performing a lumbar puncture, or working up a first time seizure. The standardization and specialty-specific focus of EPA development in neurology across the continuum of learners would help create a competency framework that better aligns UME and GME in neurology and could provide neurology residency program directors with relevant assessments of incoming trainees. For instance, a program director would know if an intern would still require direct supervision for a lumbar puncture based on the EPA assessment from the subinternship.

Looking at the application of EPAs within a neurology residency, we can envision an EPA titled recognizing and treating an acute ischemic stroke. This EPAs involves the integration of competencies from the domains of patient care, medical knowledge, and interpersonal and communication skills, among others. Explicitly linking an EPA to its critical competencies and then linking those individual competencies to the developmental milestones provides a comprehensive picture of the learner (figure 1).[16] Table e-2 (links.lww.com/WNL/A128) demonstrates the link between this EPA, its critical competencies, and the relevant neurology milestones. A neurology resident would be ready to transition into practice when reaching full entrustment in this EPA.

To date, the use and application of EPAs is not mandated as part of the formal reporting structure of the Next Accreditation System.[17] Specialty-specific EPA implementation in GME would require explicit linking to competencies and neurology milestones[5] and input from additional stakeholders such as the American Board of Psychiatry and Neurology.

While medical schools must ensure that students are ready to enter residencies, GME programs are required to ensure that their trainees are ready for independent practice upon graduation. Specialty boards, in turn, have to ensure that the practicing providers are lifelong learners and continue to practice safely and effectively. EPAs may provide a tool that can span entrustment across the entire continuum by assessing clinical skills that are important for all neurologists' development and practice. An advantage of the EPA framework in such a larger context is that it has the potential of enhancing quality of care and patient safety by providing a reliable and valid assessment structure for all levels of learners and practitioners.[13,18,19]

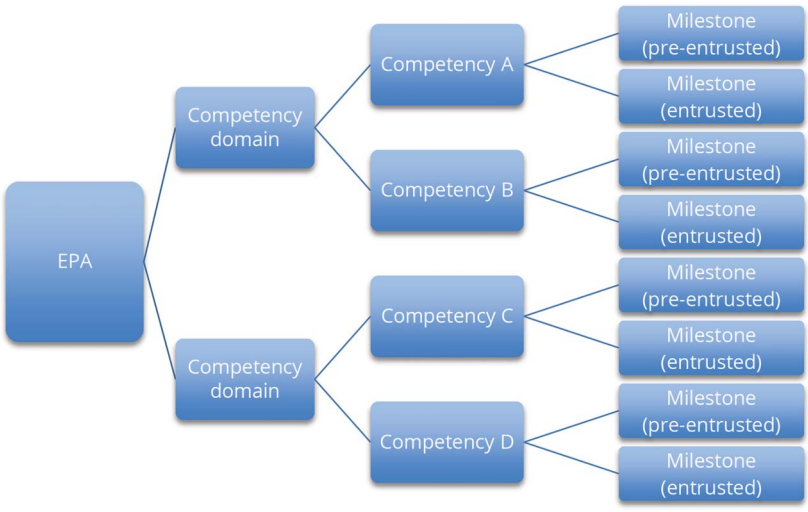
One can envision a seamless use of an EPA framework from UME through GME and into fellowship or practice. Students would begin by being entrusted with the core EPAs. These EPAs would form the foundation for specialty-specific UME-to-GME transition EPAs. Educational program leaders can determine the additional EPAs (beyond the core EPAs) that require entrustment to ensure an entering resident can hit the ground running on day 1. Each specialty can then determine the EPAs essential to their daily practice for residency to fellowship or practice transition. Finally, each subspecialty can develop EPAs that would serve as the requirement for exiting from fellowship into subspecialty practice. Figure 2 provides a pictorial view of the potential application of EPAs across the education continuum.

The Education in Pediatrics Across the Continuum (EPAC) Study Group has developed and is piloting pediatric-specific EPAs at 5 medical schools for transition from UME to GME.[3] At the time of the publication of this article, the first participants have transitioned from UME to GME based upon achievement of predetermined pediatric competencies rather than spending a defined period of time in training. In this article, we propose just such a path for the field of neurology.

Approaches to EPA development for neurology educators

With the core EPAs already established by AAMC, the first step is to define the neurology specialty EPAs for (1) transition to neurology residency; (2) transition from residency to fellowship or general neurology practice; and (3) transition from fellowship to subspecialty practice. Key stakeholders, including program directors, clerkship directors, students, residents, and fellows, can begin to draft the EPAs, which would require vetting through the relevant neurology communities. Table 2 provides an overview of key stakeholders for such a vetting process. Feedback from patients, other health care professionals, and educators not on the drafting panel may also prove helpful.[15] An example of a transitional EPA for medical students might include performing a reliable neurologic examination. An example of a neurology EPA for transition into general practice might include performing a lumbar

Figure 1 Relationship of entrustable professional activities (EPAs), competency domains, competencies, and milestones

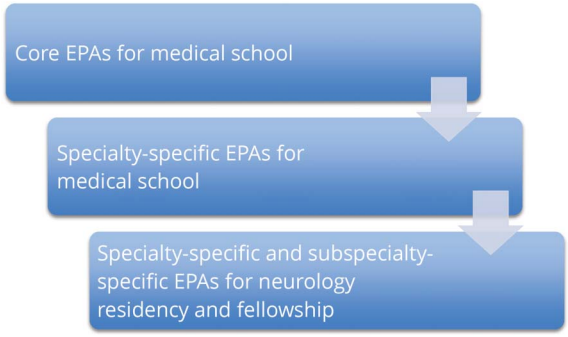


Entrustable professional activities (EPAs) usually require integration of 2 or more competency domains. The relevant competencies of each domain can be assessed through milestone markers that describe the expected behaviors for preentrustable and entrustable learners. Adapted from Core Entrustable Activities for Entering Residency.[2]

puncture. An example of a subspecialty EPA might include interpreting a sleep study.

Once the EPAs are defined, the next step is to define key functions essential to performing the task. The key functions then determine which domains of competence are required to perform that EPA and what specific competencies within those domains are required. After mapping the EPAs to their competencies, educators need to develop the curriculum necessary to ensure they are taught and assessed. There should be clarity as to where the EPA instruction will take place, and where the learner will have a chance to practice the EPA. Then the assessment plan will need to be outlined. As EPAs are performance-based, they rely heavily on direct observation.

Figure 2 Potential use of entrustable professional activities (EPAs) across the neurology education continuum



Core EPAs for medical school ([UME] level): for all students regardless of specialty choice: essential work tasks that a student should be able to perform without supervision upon transition into any type of residency; taught and assessed in third year of medical school; developed and piloted by the Association of American Medical Colleges at medical schools. Specialty-specific EPAs for medical school (UME level): for students going into the field of neurology: essential work tasks that a student should be able to perform without supervision upon transition into neurology residency; ideally taught and assessed in fourth year of medical school; to be developed by specialty (table 2). Specialty-specific and subspecialty-specific EPAs for neurology residency and fellowships (graduate medical education level): essential work tasks that a neurologist must be able to perform without supervision on transition to general neurology practice or subspecialty practice; provide a framework for curriculum development and for the assessment of the residency or fellowship milestones; do not replace or eliminate milestones (see table e-2, links.lww.com/WNL/A128) and may overlap between residency and fellowship; to be developed by specialty and subspecialties (table 2).

The authors have created a sample to demonstrate how EPAs may apply to students in a neurology clerkship as table e-5 (links.lww.com/WNL/A128). The provided assessment tool for the EPA "History taking and performing a neurologic examination" combines the binary assessment grid of preentrustable and entrustable with an expanded UME-specific, 5-point scale of entrustment to provide more granularity for medical student assessment.

This assessment tool would be distributed to medical students and preceptors and be part of the clerkship orientation as well as preceptor development process. In a standard neurology clerkship, the students would start off taking histories and performing neurologic examinations under direct supervision. The assessment tool would ideally be used after each meaningful learning episode and feedback would be given to indicate the level of performance. Preferably, an online tool would be accessed for tracking through a mobile device and the student and preceptor would discuss the reason for the chosen level of entrustment and discuss formative feedback. With improving skills, students would gradually advance to taking histories and performing neurologic examinations with indirect supervision that would be immediately available. For students who are participating in additional elective or subinternship experiences in neurology in preparation for a neurology residency, the entrustment

Table 2 Basic and specialty-specific entrustable professional activities (EPAs) along the undergraduate medical education (UME), graduate medical education (GME), and continuing medical education/maintenance of certification (CME/MOC) continuum

Type of EPA	Applicable learner group	Potential stakeholders for development, tracking, and endorsement
Basic EPA in UME (developed)	General EPAs for graduating medical student	AAMC
		LCME
Specialty-specific EPAs in UME (in discussion)[a]	Neurology-specific EPAs for medical students entering neurology residency[a]	AAMC
		LCME
		AAN Consortium of Neurology Clerkship Directors[a]
		AAN Undergraduate and Graduate Education Subcommittee/Education Committee[a]
		AAN Consortium of Neurology Residency Program Directors[a]
		ACGME Neurology RRC[a]
Specialty- and subspecialty-specific EPAs in GME (in discussion)[a]	Neurology-specific EPAs for residents or fellows entering neurologic practice[a]	ACGME
		AAN Consortium of Neurology Residency Program Directors[a]
		AAN Graduate Education Subcommittee/ Education Committee[a]
		ACGME Neurology RRC[a]
		ABPN[a]
Specialty- and subspecialty-specific EPAs in CME/MOC (in discussion)[a]	Neurology-specific EPAs required for practicing general or subspecialized neurologists[a]	American Board of Medical Specialties[a]
		ABPN[a]
		AAN Education Committee[a]
		AAN Practice Committee[a]
		United Council for Neurologic Subspecialties and other stakeholders[a]

Abbreviations: AAMC = Association of American Medical Colleges; AAN = American Academy of Neurology; ABPN = American Board of Psychiatry and Neurology; ACGME = Accreditation Council for Graduate Medical Education; LCME = Liaison Committee on Medical Education; RRC = Residency Review Committee.
[a] Areas that are relevant for neurology. (Concept adapted from Chen et al.[24]).

scale would be expanded to distant supervision if students exhibit reliable performance of the EPA. The assessments would be based on multiple observations and provided by various preceptors. The online tool would provide an aggregate assessment grid to demonstrate the progression and the clerkship director would review the data regularly, at a minimum at midrotation. If a learner does not progress as expected, the clerkship director and preceptors could provide additional opportunities for learning embedded in clinical or simulation settings. The largest change in education as a result of this type of an assessment tool is that the learner and preceptor explicitly share feedback about the competencies and performance that underlie clinical entrustment decisions. The scorecard for a student is clinically meaningful in his or her transition to residency training as the receiving program will have a clearly defined sense of what the new resident is able to do without direct supervision.

Discussion

The authors hope to foster familiarity with the concept of EPAs by neurology clerkship and program directors, as well as clinicians who may work with students on an intermittent basis. EPAs provide an excellent framework to assess learners in real-life, clinical contexts. They lead to entrustment decisions by supervisors assessing the integration of key competency domains and linking them to relevant, observable,

behavioral milestones along the trajectory of learner development.[19]

The rate of development of EPAs is accelerating and multiple sets of specialty-specific EPAs have been created for different specialties over recent years.[14,16,17,20–22] A notable implementation is EPAC, a national pilot project in pediatrics that is allowing learners to transition from UME to GME and eventually to practice by using a competency-based framework based on CEPAER and pediatric EPAs rather than time-based training.[23]

Neurology is a rich and complex field of medicine with elements of practice that require direct observation and entrustment of learners, particularly for specialty-specific activities not taught or assessed outside of neurology. While the assessment frameworks of core and specialty-specific EPAs appear to be applicable and relevant to our educator community, the concept of EPAs is not yet developed in the field of neurology. We provide a potent argument for the neurology community to consider exploring EPAs as a unifying framework for assessing competence across the continuum of education, training, and practice.

Should our community decide to adopt this framework, neurology educators would be ideal stakeholders for the creation, faculty development, implementation, and scholarship around neurology-specific EPAs. In addition, the American Academy of Neurology and its education subcommittees, including the Undergraduate Education Subcommittee, play a pivotal role in leading the effort to improve the continuum of neurology education and assessment from medical school to clinical practice.

Author contributions

Holli Horak: manuscript concept, design, development, content, and initial drafts. Robert Englander: intellectual input, manuscript concept, and critical revisions of manuscript. Diana Barratt: manuscript concept and content. Jeff Kraakevik: manuscript concept and content. Madhu Soni: manuscript concept, development, and content. Ezgi Tiryaki: manuscript concept, design, development, content, and final revisions.

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